

## **REMARKS**

### **I. Introduction**

By the present Amendment, claims 3, 5-7, 11, and 13, have been amended. Claims 1, 2, 8, 16, and 18-21 have been cancelled. Claims 24 and 25 are newly presented for consideration. Accordingly, claims 3-7, 10-15, and 22-25 are now pending in the application. Claims 6 and 13 are independent.

### **II. Office Action Summary**

In the Office Action of July 25, 2008, claims 1-12, and 20-22 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,980,846 issued to Hardy et al. ("Hardy") in view of U.S. Patent No. 5,479,537 issued to Hamashima. Claims 13-19 and 23 were rejected under 35 USC §103(a) as being unpatentable over Hardy in view of Hamashima, and further in view of U.S. Patent No. 5,668,474 issued to Heid. The cancellation of claims 1, 2, 8, 16, and 18-21 has rendered some of these grounds of rejection moot. Regarding the remaining claims, these rejections are respectfully traversed.

### **III. Rejections under 35 USC §103**

Claims 1-12, and 20-22 were rejected under 35 USC §103(a) as being unpatentable over Hardy in view of Hamashima. Regarding this rejection, the Office Action indicates that Hardy discloses a method for acquiring image data from a subject with an MRI system, and that the MRI system acquires a reference data set of a region of interest, such as the motion of the heart or the heartbeat, and then acquires a plurality of free-breathing data sets of this region of interest. The free-breathing data sets are then compared with the reference data to be used in creating

an image of the region of interest. The Office Action also indicates that it is well known in the art that an MRI system inherently comprises an RF coil for generating an RF magnetic field, a main static magnet providing a static magnetic field, gradient coils to generate the magnetic field gradients, and a controller to control the pulse sequences. The Office Action indicates that Hardy discloses a reference data set being taken during a single breath-held time period, and that the comparison between the reference and free-breathing images are done through cross-correlations to decide which images should be kept and which should be thrown away. If the feature of interest is present in any of the free-breathing images, then the cross-correlation will reveal a strong central peak, otherwise, the central peak will be offset. The Office Action indicates that Hardy does not expressly disclose setting a threshold to determine which images to reject. Nonetheless, it is presumed that some sort of threshold can be set in the form of  $L/M$  away from the  $L$ , with  $M$  being greater than two. The Office Action further indicates that the comparison is not by using a similarity coefficient, but that it would be obvious to use any sort of comparison method to obtain the proper images. The Office Action specifically points to Hamashima, which discloses an image comparison method that uses cross-correlation and threshold cut-off values to determine if an image matches a reference image. Regarding the controller, the Office Action indicates that any controller has the ability to create a desired sequence of pulses wanted. Applicants respectfully disagree.

As amended, independent claim 6 defines an inspection apparatus that includes a controller for controlling a pulse sequence that applies a radiofrequency magnetic field as well as a magnetic field gradient to a living body placed within a static magnetic field, in order to determine a nuclear magnetic resonance signal

produced from the body. In a state where the body is not inhaling or exhaling, the controller controls a first pulse sequence to detect the nuclear magnetic resonance signal and acquire a reference projection of an imaging section for monitoring respiratory motion of the body. During breathing, the controller next controls execution of one of the first pulse sequences to detect the nuclear magnetic resonance signal and acquire a projection of the imaging section to monitor the state of the body during breathing.

Next, the controller repeats a second pulse sequence to detect the nuclear magnetic resonance signal and acquire an image of the imaging section at predetermined repetition time intervals. The controller collects the nuclear magnetic resonance signals and reconstructs an image of the imaging section and the second pulse sequence based on a similarity coefficient between the projection and the reference projection. The similarity coefficient is provided in the form of a scalar value, while the projection and reference projection are one-dimensional in nature. Additionally, the controller is programmed to apply an average of the projections of the imaging section acquired from the nuclear magnetic resonance signals detected by repeating the first pulse sequence as the reference projection. According to at least one benefit of independent claim 6, it is possible to remove the influence of the heartbeat from the reference projection. This is achieved by executing the pulse sequence repeatedly in order to measure a plurality of echoes and subsequently averaging the echoes for one heartbeat.

The Office Action indicates that the combination of Hardy and Hamashima discloses all of the features recited in independent claim 1. This does not appear to be the case. Contrary to the claimed invention, Hardy relates to an ECG-gated fat-suppressed multi-sliced spiral imaging technique which synchronizes with an

electrocardiogram. See column 3, lines 22-32. Consequently, Hardy never considers, or accounts for, the influences of the heartbeat on the reference image. Therefore, Hardy's method and system cannot be applied to achieve the features and benefits of the claimed invention.

Applicants further note that Hamashima discloses the image to be compared being cut from the input image, and the reference image being passed through different filters. There is no disclosure or suggestion for repeatedly executing the pulse sequence in order to measure plural echoes and averaging the echoes for one heartbeat.

It is therefore respectfully submitted that independent claim 6 is allowable over the art of record.

Claims 3-5, 7, 10-12, 22, and 25 depend from independent claim 6, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 6. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 13 defines an inspection apparatus using nuclear magnetic resonance. The apparatus includes various features that are somewhat similar to those recited in independent claim 6. In particular, the apparatus of independent claim 13 includes a controller that is programmed to apply the average of the projections of the imaging section acquired from the nuclear magnetic resonance signals. Additionally, the arithmetic processor obtains an average of the projections of the imaging section acquired from the nuclear magnetic resonance signals detected by repeating the first pulse sequence as the reference projection. As previously discussed, such features do not appear to be disclosed or suggested by the art of record.

It is therefore respectfully submitted that independent claim 13 is allowable over the art of record. Claims 14, 15, 23, and 24 depend from independent claim 13, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 13. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Claims 4, 8, 10, 12, 14-16, 19, 22, and 23 depend from these claims, and are therefore believed allowable for at least the reasons set forth above with respect to the independent claims. In addition, these dependent claims each introduce novel elements that independently render them patentable over the art of record.

#### **IV. Conclusion**

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

**AUTHORIZATION**

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 520.42912X00).

Respectfully submitted,  
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